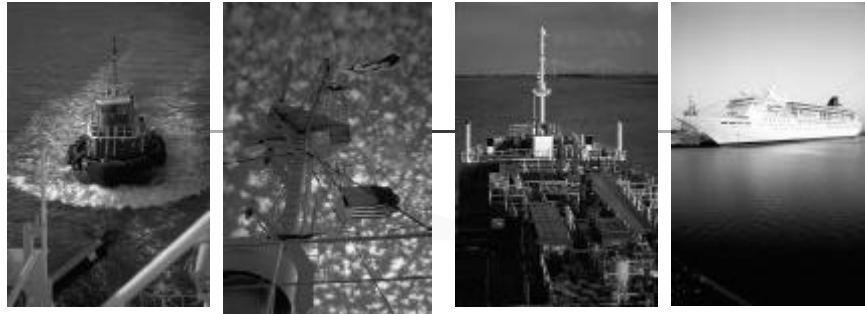


Overview of the Houston-Galveston Area Vessel Emissions Inventory (HGAVEI) Study



Bruce Anderson, Principal
Starcrest Consulting Group, LLC



Components of the HGAVEI

- History
- Areal Extent
- Vessel Classes Inventoried
- Unique Approach
- Findings and Benefits



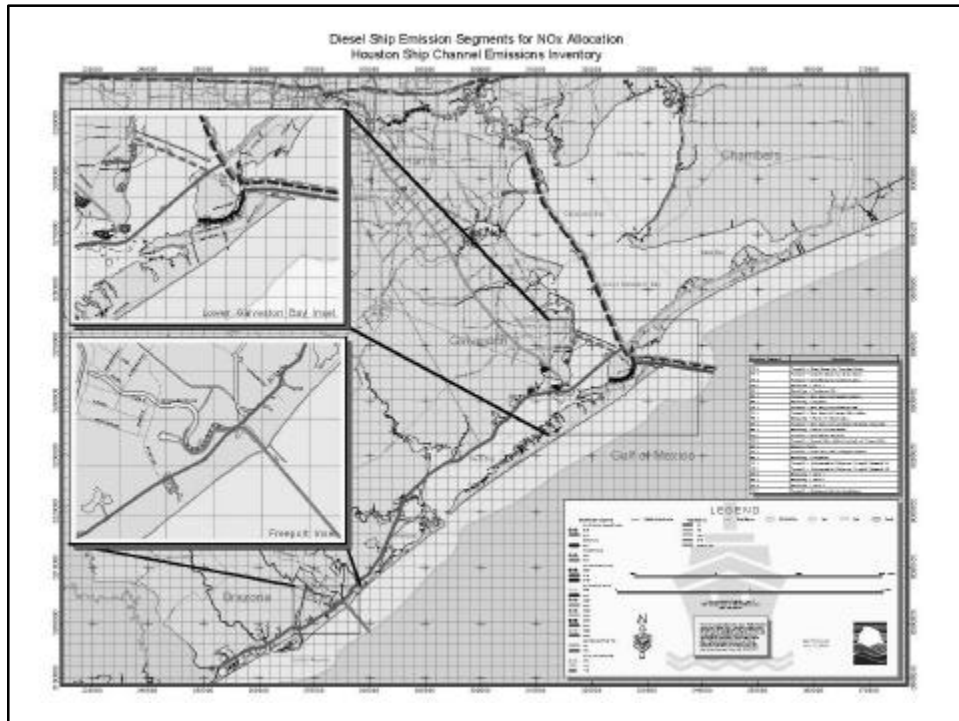
Vessel Inventory History

- 1990 – Based on Marine Fuel Sales
- 1991 – Based on 1988 Vessel Registry/Counts
- 1993 – Based on Limited Vessel and Water Traffic Counts
- 1999 – HGAVEI Based on Interviews, Comprehensive Vessel Movement Databases, and First Hand Experience

Areal Extent

- Commercially Navigable Coastal Waters within the 8 County Houston-Galveston Ozone Nonattainment Area
 - Houston, Galveston, Texas City, Freeport Ship Channels, and Gulf Intracoastal Water Way





Vessel Classes Inventoried

- Ocean-Going Vessels (OGVs)
 - Tankers
 - Container Ships
 - General Cargo Vessels
 - Bulk Vessels
 - Liquid Petroleum Gas Carriers
 - Cruise Ships
 - Other OGVs
- Towboats
 - Line Haul, Unit Tow, and Fleeting Operations
- Harbor Vessels
 - Assist Tugs, Dredges, Ferries, & Excursion Vessels



Unique Approach

- Traditional Inventories – Top Down
- HGAVEI Approach – Bottom Up
- Informal Public/Private Partnership –
 - Over 60 Individual Contributors
 - Access to Owners, Operators, Vessels and Crews



Public/Private Partnership

- | | |
|-----------------------------|------------------------------|
| • Port of Houston Authority | • Buffalo Marine Svcs Inc |
| • H&G Pilot Associations | • Mobil-Exxon |
| • Stolt-Nielsen Trans Corp | • SeaRiver Maritime Inc |
| • Kirby Marine Trans Corp | • Bayship Management |
| • Maersk-Sealand, Inc | • West Gulf Maritime Assn |
| • Greater Hou Port Bureau | • Carriers Container Council |
| • Stolthaven | • Celanese |
| • Intracoastal Towing | • American Eagle Tankers |
| • King Fisher Marine Svcs | • Odfjell Terminals |
| • Great Lakes Dredge Co | • Skaugen PetroTrans Inc |
| • TxDOT & TNRCC | |
| • Hou Fuel Oil Termnl Co | |

Findings

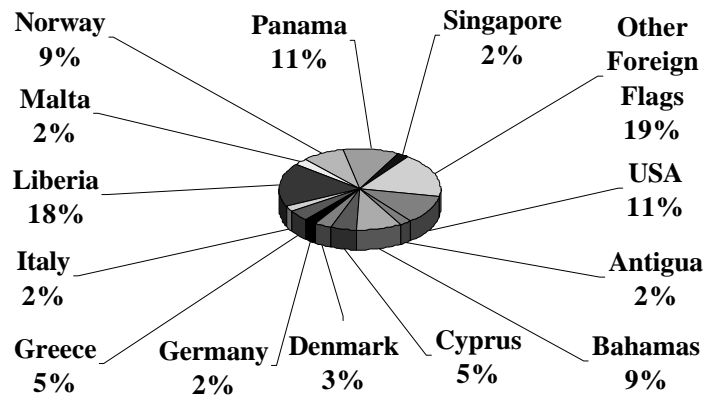
- Previous Assumptions That Were Updated
 - Vessel Transit, Dwell, and Call Times
 - Assist Tug & Towboat Time in Mode
 - Towboat Operational Levels by hp Rating
 - Assist Tug & Towboat Fuel Consumption
 - Updated Emission Factors (g/tonne to g/hp-hr)
 - General Operational Information

Findings (cont'd)

- Vessel Emissions Were Previously Over-Estimated
 - 1990 HGAVEI: 14.6 tpd VOC 75.3 tpd NOx
 - 1991 HGAVEI: 3.8 tpd VOC 40.0 tpd NOx
 - 1993 HGAVEI: 4.3 tpd VOC 50.6 tpd NOx
 - 2000 HGAVEI: 1.0 tpd VOC 31.5 tpd NOx

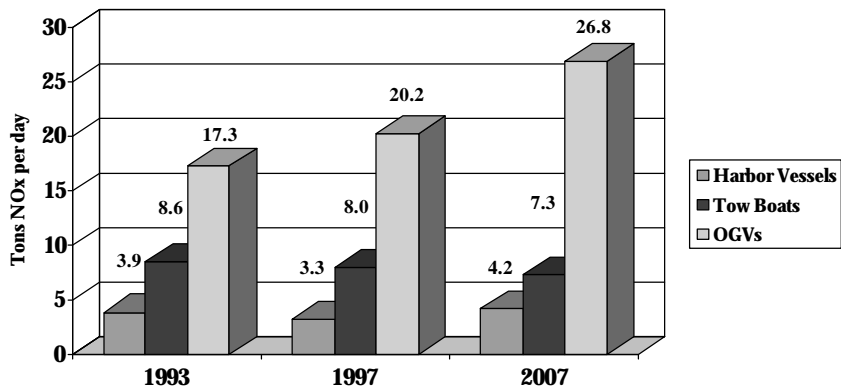
Findings (cont'd)

- Vessel Registration for OGVs Calling on Port of Houston



Findings (cont'd)

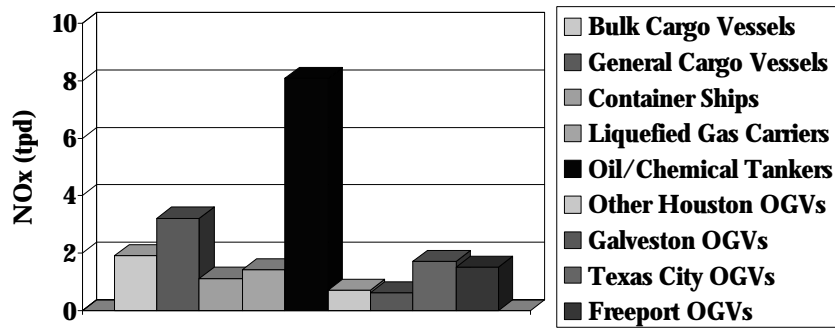
- Emissions by Vessel Type



Findings (cont'd)

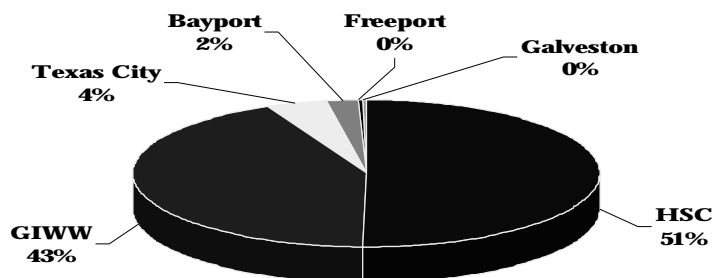
- Emissions by OGV Type

NO_x Emissions by OGV Type



Findings (cont'd)

- Towboat Emissions By Channel



Benefits

- Greater Understanding of HGA Vessel Operations
- HGAVEI Included in State Implementation Plan (SIP)
- Tool for Effective Source Management
- Tool for Effective Comments on Proposed Regulations
- Tool for Assessing Potential Impacts of Proposed Facilities

Where to find the HGAVEI on the Web

- TNRCC Houston-Galveston SIP Appendix C

[http://www.tnrcc.state.tx.us/updated/oprd/
rule_lib/sip_appxs.html](http://www.tnrcc.state.tx.us/updated/oprd/rule_lib/sip_appxs.html)



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